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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/525,058	Applicant(s) BRABEC ET AL.	
	Examiner GOLAM MOWLA	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6,7,9-16,20-25,27,28,30-51 and 53-56 is/are pending in the application.
- 4a) Of the above claim(s) 54-56 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,7,9-16,20-25,27,28,30-51 and 53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: <u>See Continuation Sheet</u> . |

Continuation of Attachment(s) 6). Other: Non-Patent Literature: (1) Brabec et al., "Origin of the Open Circuit Voltage of Plastic Solar Cells", Adv. Funct. Mater. 2001, 11, No. 5, October; and (2) Meinhardt et al., "Optoelectronic devices made from multilayer and molecularly doped organic layers", Proc. SPIE, Vol. 3623, 46 (1999).

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DETAILED ACTION

Response to Amendment

1. Applicant's amendment of 06/09/2010 does not place the Application in condition for allowance.
2. Claims 1, 3-4, 6-7, 9-16, 20-25, 27-28, 30-51 and 53-56 currently are pending. Applicant has amended claims 4, 16, 23, 36, 38 and 40, cancelled claims 2, 5, 8, 17-19, 26, 29 and 52. Claims 54-56 are withdrawn from consideration as being part of non-elected invention/group.

Status of the Objections or Rejections

3. The rejection of claims 1, 3-4, 6-7, 9-16, 20-25, 27-28, 30-51 and 53 from the previous office Action dated 02/22/2010 are withdrawn in view of Applicant's amendment and/or persuasive arguments. However, upon further consideration, a new ground of rejection is presented below.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
5. Claims 4, 6, 12-13, 20, 23-25, 27, 30-31, 33-42, 44 and 46-49 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to

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reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 4, 16, 23, 36, 38 and 40 recite the limitation “the organic semiconductor layer is not structured for increasing light absorptivity”, which is not supported by the original disclosure as filed. The limitation “the organic semiconductor layer is not structured for increasing light absorptivity” is a negative limitation which explicitly excludes the organic semiconductor layer to have any structured surface. However, instant specification fails to disclose as to whether structured organic semiconductor layer is excluded. On the contrary, instant specification explicitly discloses that the electrode and the semiconductor layer follows the structure of the substrate in order to increase the absorptivity of the semiconductor layer (page 2, last full paragraph) (see also page 3, paragraph starting with "Light trapping..."). Examiner believes the purpose of this amendment was to overcome the Saurer reference (US 5482570) because the semiconductor layer in the photovoltaic device of Saurer is structured. Therefore, Applicant is suggested to claim “wherein all surfaces of the organic semiconductor layer is planar”.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1, 4, 7, 9-11, 21-22, 28, 31-32, 36-43, 45, 47-51 and 53 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kambe et al. (US 5,986,206) in view of Brabec et al. ("Origin of the Open Circuit Voltage of Plastic Solar Cells", Adv. Funct. Mater. 2001, 11, No. 5, October) and Ponewash (US 5,782,993).

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Regarding claims 1, 4, 7, 21, 28, 31-32, 36, 38, 40, 42-43, 45, 47-51 and 53, Kambe discloses an organic photovoltaic component/cell (solar cell 100) (fig. 1) (3:18-50) or a method of making/providing an organic photovoltaic cell (solar cell 100) (fig. 1) (3:18-50), comprising:

- a transparent substrate (114) having a first surface (inner surface) and a second surface (outer surface) opposite the first surface (see fig. 1),
- a first electrode (transparent electrode 112), the first electrode (114) being closer to the first surface (inner surface) of the substrate (114) than the second surface (outer surface) of the substrate (114),
- an organic semiconductor layer (electron donor layer 102 and electrode acceptor layer 104) (3:18-27) comprising a conjugated polymer (102) (5:1-17) and an acceptor (104) such as a fullerene (5:18-35), the first electrode (112) being between the substrate (114) and the organic semiconductor layer (102+104), the organic semiconductor layer (102+104) is not structured for increasing light absorptivity (3:28-31), and
- a second electrode (110), the organic semiconductor (102+104) being between the first (112) and second (110) electrodes.

Although the reference discloses the substrate is made of transparent material, the reference, however, is silent as to whether the substrate is a flexible polymer sheet.

Brabec discloses an organic photovoltaic component/cell (solar cell as shown in figure 1) or a method of making/providing an organic photovoltaic cell (solar cell as shown in figure 1) comprising an organic semiconductor comprising a conjugated donor and an acceptor (pages 374- 375). The reference further discloses a transparent electrode made of indium/tin oxide is

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formed on a substrate which is a flexible polymer sheet (plastic foil or polyester substrate) (see figure 1 and §2.3).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to have utilized the flexible sheet (plastic foil) of Brabec and/or Ponewash as the transparent substrate (114) in the organic photovoltaic component/cell (solar cell 100) or the method of making the organic photovoltaic component/cell (solar cell 100) of Kambe in order to allow for a device with improved mechanical flexibility, as taught by Brabec (see page 374).

However, the references are silent as to whether the first surface (inner surface) of the flexible plastic foil (114) of the organic photovoltaic component/cell (solar cell 100) of Kambe in view of Brabec is periodically structured.

Ponewash teaches a plastic/polymer photovoltaic component (photovoltaic device 10) (fig. 1) or a method of providing a plastic/polymer photovoltaic component (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic component (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the transparent substrate (114) in the organic photovoltaic component/cell (solar cell 100) or in the method of making the organic photovoltaic component/cell (solar cell 100) of Kambe in view of

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Brabec in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

Thus, Kambe in view of Brabec and Ponewash further discloses (a) the first surface (inner surface) of the substrate (114) is structured, (b) the first electrode (112) has a planar surface (surface of 112 which is in contact with the donor layer 102), and (c) the organic photovoltaic component (100) is configured such that, during use, light passes through the substrate (114) prior to reaching the organic semiconductor layer (102+104) (see figure 1 of Kambe for configuration).

Regarding claim 9, Kambe in view of Brabec and Ponewash further discloses that a surface (either top or bottom) of the organic semiconductor is planer (see figure 1 of Kambe).

Regarding claim 10, Kambe in view of Brabec and Ponewash further discloses that the first electrode (112) is disposed on the first surface (inner surface) of the substrate (114) (see figure 1 of Kambe).

Regarding claim 11, Kambe in view of Brabec and Ponewash further discloses that the first electrode (112) is a transparent electrode which is made of ITO (6:15-17), and therefore, is a cathode.

Regarding claim 22, Kambe in view of Brabec and Ponewash further discloses that the first electrode (112) has a structured surface (bottom surface of the electrode 112).

Regarding claims 37, 39 and 41, Kambe in view of Brabec and Ponewash further discloses that the periodic structure of the substrate (114) is configured to impart light trapping during use of the organic photovoltaic component (100) (see full discussion of Ponewash).

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8. Claims 3, 6, 12-15 and 30 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kambe in view of Brabec and Ponewash as applied to claim 1, 4 or 7 above, and further in view of Meinhardt et al. ("Optoelectronic devices made from multilayer and molecularly doped organic layers", Proc. SPIE, Vol. 3623, 46 (1999)).

Applicant is directed above for complete discussion of Kambe in view of Brabec and Ponewash with respect to claim 1, 4 or 7, which is incorporated herein. However, the reference is silent as to an additional layer between the substrate and the first electrode, or to an additional layer between the organic semiconductor and the first electrode.

Meinhardt discloses a photovoltaic cell wherein the ITO electrode is coated with an organic electrode (PEDOT:PSS) in order to lower the sheet- resistance and also to improve thermal and UV stabilities (figure 2) (page 48).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to have utilized the organic electrode (PEDOT:PSS) of Meinhardt in the in the organic photovoltaic component/cell (solar cell 100) or in the method of making the organic photovoltaic component/cell (solar cell 100) of Kambe in view of Brabec and Ponewash in order to coat the transparent ITO electrode (112) of Kambe in view of Brabec and Ponewash such that the sheet-resistance is lowered and thermal and UV stabilities are also improved, as taught by Meinhardt.

Thus, Kambe in view of Brabec, Ponewash and Meinhardt discloses a bilayer electrode (ITO: PEDOT-PSS) of which the surface of transparent ITO electrode (112) which is in contact with the substrate is structured and surface of the ITO electrode (112) which is in contact with the PEDOT-PSS organic electrode is planar (see figure 2 of Meinhardt).

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Regarding claims 3, 6, and 30, Kambe in view of Brabec, Ponewash and Meinhardt discloses an additional layer (transparent ITO electrode 112) between the substrate (114) and the first electrode (organic electrode of Meinhardt), the additional layer (112) having a structured surface (surface of the electrode 112 which is in contact with the substrate 114).

Regarding claims 12 and 13, Kambe in view of Brabec, Ponewash and Meinhardt discloses a planarized layer (transparent ITO electrode 112 of which surface which is in contact with the PEDOT-PSS organic electrode is planar) between the substrate (114) and the first electrode (organic PEDOT-PSS electrode of Meinhardt), the first electrode (organic PEDOT-PSS electrode of Meinhardt) is disposed on a planarized surface (surface of ITO electrode 112 which is in contact with the PEDOT-PSS organic electrode) of the planarized layer (112).

Regarding claims 14 and 15, Kambe in view of Brabec, Ponewash and Meinhardt discloses a planarized layer (organic PEDOT-PSS electrode of Meinhardt) between the organic semiconductor (102+104) and the first electrode (112), wherein the first electrode (112) is disposed on the substrate (114).

9. Claims 16, 20 and 44 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Fujimori et al. (US 2002/0108649 A1) in view of Ponewash (US 5,782,993), and further in view of Shaheen et al. (WO/2001/084644, refer to US 2003/0159729 A1 for translation).

Regarding claims 16, 20 and 44, Fujimori discloses a photovoltaic cell (photoelectric conversion device comprising organic compound) comprising:

- a flexible substrate (2) (fig. 2, ¶ 0069 and [0074]),
- a first electrode (comb-teeth-like electrode) ([0082]),

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- a first layer (transparent electrode) [0082]), the first layer being between the substrate (2) and the first electrode (comb-teeth-like electrode),
- a second layer (barrier layer 8);
- a second electrode (6) (fig. 2, ¶ 0069),
- an organic semiconductor layer (hole transport layer 5, fig. 2; ¶ 0069, 0104, 0016, 0221, 0223) between first (comb-teeth-like electrode) and second (6) electrodes (see figure 2), and
 - wherein the second layer (8) is between the first electrode (comb-teeth-like electrode) and the organic semiconductor (5), the first electrode is structured, a surface of the second layer (8) is planar, organic semiconductor layer (5) is not structured for increasing light absorptivity, and the photovoltaic cell is configured so that, during use, light passes through the substrate prior to reaching the organic semiconductor layer (5) (see fig. 2 for passage of light, also [0070]).

However, Fujimori does not explicitly disclose whether the first surface of the substrate is structured.

Ponewash teaches a plastic/polymer photovoltaic cell (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic cell (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

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Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the flexible transparent substrate (2) in the photovoltaic cell of Fujimori in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

However, the references are silent as to whether the organic semiconductor layer comprises a conjugated polymer and an acceptor such as a fullerene.

Shaheen discloses an organic photovoltaic component (fig. 1) ([0010-0014]) having an improved short-circuit current ([0003] and [0005]) due to presence of a conjugated polymer and an acceptor such as a fullerene ([0011]) in an organic semiconductor layer (photoactive layer 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the conjugated polymer and the acceptor of Shaheen in the organic semiconductor layer of Fujimori in view of Ponewash in order to allow for an organic photovoltaic component with increased short-circuit current, as taught by Shaheen.

Therefore, Fujimori in view of Ponewash further discloses the bottom surface of the first layer (the transparent electrode layer) is structured (since the bottom surface of transparent electrode layer is same as the top surface of the substrate, which is structured).

10. Claims 23-25, 27, 33-35 and 46 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kambe et al. (US 5,986,206) in view of Meinhardt et al. ("Optoelectronic devices made from multilayer and molecularly doped organic layers", Proc. SPIE, Vol. 3623, 46 (1999)), Brabec et al. ("Origin of the Open Circuit Voltage of Plastic Solar Cells", Adv. Funct. Mater. 2001, 11, No. 5, October) and Ponewash (US 5,782,993).

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Regarding claims 23 and 46, Kambe discloses an organic photovoltaic cell (solar cell 100) (fig. 1) (3:18-50), comprising:

- a transparent substrate (114) having a first surface (inner surface) and a second surface (outer surface) opposite the first surface (see fig. 1),
- a first electrode (transparent electrode 112), the first electrode (114) being closer to the first surface (inner surface) of the substrate (114) than the second surface (outer surface) of the substrate (114),
- an organic semiconductor layer (electron donor layer 102 and electrode acceptor layer 104) (3:18-27) comprising a conjugated polymer (102) (5:1-17) and an acceptor (104) such as a fullerene (5:18-35), the first electrode (112) being between the substrate (114) and the organic semiconductor layer (102+104), the organic semiconductor layer (102+104) is not structured for increasing light absorptivity (3:28-31), and
- a second electrode (110), the organic semiconductor (102+104) being between the first (112) and second (110) electrodes,
 - wherein the photovoltaic cell (100) is configured such that, during use, light passes through the substrate (114) prior to reaching the organic semiconductor layer (102+104) (see figure 1 of Kambe for configuration).

However, the reference is silent as to a support layer between the substrate (114) and the first electrode (112)

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Meinhardt discloses a photovoltaic cell comprising a transparent bilayer electrode having an ITO electrode coated with an organic electrode (PEDOT:PSS) in order to lower the sheet-resistance and also to improve thermal and UV stabilities (figure 2) (page 48).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to have utilized the transparent bilayer electrode (ITO coated with PEDOT:PSS) of Meinhardt instead of the transparent electrode (112) of Kambe in the photovoltaic cell (solar cell 100) of Kambe such that the sheet-resistance is lowered and thermal and UV stabilities are also improved, as taught by Meinhardt.

Thus, the ITO electrode of the transparent bilayer electrode (ITO coated with PEDOT:PSS) of Meinhardt reads on instant support layer having a surface (top or bottom surface) and the organic electrode of the transparent bilayer electrode (ITO coated with PEDOT:PSS) of Meinhardt reads on instant first electrode, wherein the support layer (ITO electrode) is between the substrate (114) and the first electrode (PEDOT:PSS).

Although Kambe in view of Meinhardt discloses the substrate is made of transparent material, the reference, however, is silent as to whether the substrate is a flexible polymer sheet.

Brabec discloses an organic photovoltaic cell (solar cell as shown in figure 1) comprising an organic semiconductor comprising a conjugated donor and an acceptor (pages 374- 375). The reference further discloses a transparent electrode is formed on a substrate which is a flexible polymer sheet (plastic foil or polyester substrate) (see figure 1 and §2.3).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to have utilized the flexible sheet (plastic foil) of Brabec as the transparent substrate (114) in the organic photovoltaic component/cell (solar cell 100) or the method of making the organic

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photovoltaic component/cell (solar cell 100) of Kambe in order to allow for a device with improved mechanical flexibility (see page 374).

However, the references are silent as to whether the first surface (inner surface) of the flexible plastic foil (114) of the organic photovoltaic component/cell (solar cell 100) of Kambe in view of Meinhardt and Brabec is periodically structured.

Ponewash teaches a plastic/polymer photovoltaic cell (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic component (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the transparent substrate (114) in the organic photovoltaic cell (solar cell 100) of Kambe in view of Meinhardt and Brabec in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

Regarding claims 24-25 and 33-35, Kambe in view of Meinhardt, Brabec and Ponewash further discloses that the surface (surface which is in contact with the substrate 114) of the support layer (ITO electrode of the transparent bilayer electrode of Meinhardt) is structured. The references further disclose that the periodic structure of the substrate (114) is configured to impart light trapping during use of the organic photovoltaic component (100) (see full discussion of Ponewash).

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Regarding claim 27, Kambe in view of Meinhardt, Brabec and Ponewash further discloses that the surface (surface of ITO electrode of the transparent bilayer electrode which is in contact with the PEDOT:PSS electrode of the transparent bilayer electrode of Meinhardt) of the support layer (ITO electrode of the transparent bilayer electrode of Meinhardt) is planar.

11. Claims 1, 3-4, 6, 16, 20-21, 23-25, 27-28, 30-31, 33-42, 44, 46-51 and 53 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Fujimori et al. (US 2002/0108649 A1) in view of Ponewash (US 5,782,993), and further in view of Shaheen et al. (WO/2001/084644, refer to US 2003/0159729 A1 for translation).

Regarding claims 1, 4, 21, 28, 31, 36-42, 47-51 and 53, Fujimori discloses an organic photovoltaic cell (photoelectric conversion device comprising organic compound) comprising:

- a polymeric flexible substrate (2) (fig. 2) which is made of PET ([0069] and [0074]) having a first surface (inner surface) and a second surface (outer surface) opposite the first surface,
- a first electrode (first electrode 3, fig. 2, ¶ 0069), the first electrode being closer to the first surface of the substrate than the second surface of the substrate (2),
- an organic semiconductor layer (hole transport layer 5, fig. 2; ¶ 0069, 0104, 0016, 0221, 0223), the first electrode (3) being between the substrate (2) and the organic semiconductor layer (5) (see figure 2), wherein the semiconductor layer (4) is not structured to increase light absorptivity, and
- a second electrode (second electrode 6, fig. 2, ¶ 0069), the organic semiconductor layer (5) being between the first (3) and the second (6) electrodes,

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- wherein the substrate (2) is a flexible sheet ([0071] and [0074]), the first electrode (3) has a planar surface ([0076-0083]), and the organic photovoltaic component (5) is configured so that, during use, light passes through the substrate prior to reaching the organic semiconductor layer (5) (see fig. 2 for passage of light, also [0070]).

However, Fujimori does not explicitly disclose whether the first surface of the substrate is structured.

Ponewash teaches a plastic/polymer photovoltaic cell (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic cell (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the flexible transparent substrate (2) in the photovoltaic cell of Fujimori in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

However, the references are silent as to whether the organic semiconductor layer comprises a conjugated polymer and an acceptor such as a fullerene.

Shaheen discloses an organic photovoltaic component (fig. 1) ([0010-0014]) having an improved short-circuit current ([0003] and [0005]) due to presence of a conjugated polymer and an acceptor such as fullerene ([0011]) in an organic semiconductor layer (photoactive layer 4).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the conjugated polymer and the acceptor of Shaheen in the organic semiconductor layer of Fujimori in view of Ponewash in order to allow for an organic photovoltaic component with increased short-circuit current, as taught by Shaheen.

Regarding claims 3, 6 and 30, Fujimori in view of Ponewash further discloses that the first electrode (3) is a laminated layer of a comb-teeth like electrode and a transparent electrode layer (see [0082]), of which the comb-teeth like electrode reads on instant first electrode, and the transparent electrode layer reads on instant additional layer of which the bottom surface is structured (since the bottom surface of transparent electrode layer is same as the top surface of the substrate, which is structured) and the top surface is planar on which the first electrode (comb-teeth like electrode) is formed.

Regarding claims 16, 20, 23-25, 27, 33-35, 44 and 46, Fujimori discloses an organic photovoltaic cell (photoelectric conversion device comprising organic compound), comprising:

- a polymeric flexible substrate (2) (fig. 2) which is made of PET ([0069] and [0074]) having a first surface (inner surface) and a second surface (outer surface) opposite the first surface,
- a first/support layer (transparent electrode, [0082]) having a surface (top or bottom surface),
- a first electrode (comb-teeth-like electrode) ([0082]), the first/support layer (transparent electrode, [0082]) being between the substrate (2) and the first electrode (comb-teeth-like electrode),
- a second electrode (6) (fig. 2, ¶ 0069),

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- an organic semiconductor layer (hole transport layer 5, fig. 2; ¶ 0069, 0104, 0016, 0221, 0223) between first (comb-teeth-like electrode) and second (6) electrodes (see figure 2), wherein the semiconductor layer (4) is not structured to increase light absorptivity,
- a second layer (barrier layer 8) between the first electrode (comb-teeth-like electrode) and the organic semiconductor (5),
 - wherein the first electrode (comb-teeth-like electrode) is between the first/support layer (transparent electrode layer) and the organic semiconductor (5), and the photovoltaic cell is configured so that, during use, light passes through the substrate prior to reaching the organic semiconductor layer (5) (see fig. 2 for passage of light, also [0070]).

However, Fujimori does not explicitly disclose whether the first surface of the substrate is periodically structured to impart light trapping during the use of the organic photovoltaic component.

Ponewash teaches a plastic/polymer photovoltaic cell (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic cell (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the

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flexible transparent substrate (2) in the photovoltaic cell of Fujimori in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

Thus, Fujimori in view of Ponewash further discloses the top surface of the first/support layer (transparent electrode layer) is planar, the bottom surface of the first/support layer (the transparent electrode layer) is structured (since the bottom surface of transparent electrode layer is same as the top surface of the substrate, which is structured), the first electrode (comb-teeth-like electrode) is structured, a surface of the second surface is planar (top surface of barrier layer 8), and the top surface of the substrate is periodically structured (see figure 1 of Ponewash).

However, the references are silent as to whether the organic semiconductor layer comprises a conjugated polymer and an acceptor such as a fullerene.

Shaheen discloses an organic photovoltaic component (fig. 1) ([0010-0014]) having an improved short-circuit current ([0003] and [0005]) due to presence of a conjugated polymer and an acceptor such as fullerene ([0011]) in an organic semiconductor layer (photoactive layer 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the conjugated polymer and the acceptor of Shaheen in the organic semiconductor layer of Fujimori in view of Ponewash in order to allow for an organic photovoltaic component with increased short-circuit current, as taught by Shaheen.

12. Claims 7, 9-15, 22 and 32 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Fujimori et al. (US 2002/0108649 A1) in view of Ponewash (US 5,782,993).

Regarding claim 7, Fujimori discloses a photovoltaic cell (photoelectric conversion device comprising organic compound) comprising:

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- a polymeric flexible substrate (2) (fig. 2) which is made of PET ([0069] and [0074]) having a first surface (inner surface) and a second surface (outer surface) opposite the first surface,
- a first electrode (first electrode 3, fig. 2, ¶ 0069), the first electrode being closer to the first surface of the substrate than the second surface of the substrate (2),
- an organic semiconductor layer (hole transport layer 5, fig. 2; ¶ 0069, 0104, 0016, 0221, 0223), the first electrode (3) being between the substrate (2) and the organic semiconductor layer (5) (see figure 2), and
- a second electrode (second electrode 6, fig. 2, ¶ 0069), the organic semiconductor layer (5) being between the first (3) and the second (6) electrodes,
 - wherein the substrate (2) is a flexible sheet ([0071] and [0074]), the first electrode (3) has a planar surface ([0076-0083]), and the organic photovoltaic component (5) is configured so that, during use, light passes through the substrate prior to reaching the organic semiconductor layer (5) (see fig. 2 for passage of light, also [0070]).

However, Fujimori does not explicitly disclose whether the first surface of the substrate is structured.

Ponewash teaches a plastic/polymer photovoltaic cell (photovoltaic device 10) (fig. 1) (2:45-63). Ponewash further teaches that the light enters the photovoltaic cell (10) through a flexible polymer/plastic substrate (first outer layer 20 which is made of PET, i.e., Mylar) (see figure 1) (2:49-52), wherein the inner surface (21) of the substrate (20) through which light

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enters the photovoltaic component (10) is periodically structured (see figure 1 for configuration) in order to increase the collection efficiency of the photovoltaic cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flexible polymer/plastic transparent substrate of Ponewash as the flexible transparent substrate (2) in the photovoltaic cell of Fujimori in order to increase the collection efficiency of the photovoltaic cell, as taught by Ponewash.

Regarding claim 9, Fujimori further discloses that a surface of the organic semiconductor is planar (see fig.2 for configuration).

Regarding claim 10, Fujimori further discloses that the first electrode (3) is disposed on the first surface of the substrate (2) (see fig. 2).

Regarding claim 11, Fujimori further discloses that the first electrode (3) is a cathode ([0077]).

Regarding claims 12 and 13, Fujimori in view of Ponewash further discloses that the first electrode (3) is a laminated layer of a comb-teeth like electrode and a transparent electrode layer (see [0082]), of which the comb-teeth like electrode reads on instant first electrode, and the transparent electrode layer reads on instant additional layer of which the bottom surface is structured (since the bottom surface of transparent electrode layer is same as the top surface of the substrate, which is structured) and the top surface is planar on which the first electrode (comb-teeth like electrode) is formed.

Regarding claim 14, Fujimori further discloses a planarized layer (barrier layer 8, ¶ 0069; see fig. 7 that shows the barrier layer is planarized) between the organic semiconductor (5) and the first electrode (3).

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Regarding claim 15, Fujimori further discloses that the first electrode (3) is disposed on the substrate (2) (see fig. 2).

Regarding claim 22, Fujimori further discloses that the first electrode (comb-teeth like electrode) has a structured surface.

Regarding claim 32, Fujimori in view of Ponewash discloses the first surface of the substrate (2) has a periodic structure (see figure 1 of Ponewash).

13. Claims 43 and 45 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Fujimori et al. (US 2002/0108649 A1) in view of Ponewash (US 5,782,993) as applied to claim 7 above, and further in view of Shaheen et al. (WO/2001/084644, refer to US 2003/0159729 A1 for translation)

Regarding claims 43 and 45, Applicant is directed above for complete discussion of Fujimori in view of Ponewash with respect to claim 7, which is incorporated herein. However, the references are silent as to whether the organic semiconductor layer comprises a conjugated polymer and an acceptor such as a fullerene.

Shaheen discloses an organic photovoltaic component (fig. 1) ([0010-0014]) having an improved short-circuit current ([0003] and [0005]) due to presence of a conjugated polymer and an acceptor such as fullerene ([0011]) in an organic semiconductor layer (photoactive layer 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the conjugated polymer and the acceptor of Shaheen in the organic semiconductor layer of Fujimori in view of Ponewash in order to allow for an organic photovoltaic component with increased short-circuit current, as taught by Shaheen.

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Response to Arguments

14. Applicant's arguments with respect to claims 1, 3-4, 6-7, 9-16, 20-25, 27-28, 30-51 and 53 have been fully considered but are moot in view of the new ground(s) of rejection.

With respect to independent claims 1 and 7, Applicant argues that the prior art of record alone or in combination fails to teach the claimed subject matter, most particularly the art of record fails to a first electrode having a planar surface because the electrode of Saurer closes embraces the configuration of the structured surface of the substrate and therefore the surface of the electrode would also be structured (see Remarks, pages 1-3).

This argument is persuasive and is moot in view of new ground of rejection as presented above.

With respect to independent claims 4, 16, 23, 36, 38 and 40, Applicant argues that Fujimori, Saurer, and Shaheen alone or in combination fail to recite a photovoltaic component or cell including a substrate having a structured surface and an organic semiconductor layer or an organic semiconductor that is not structured for increasing light absorptivity (Remarks, page 3).

This argument is directed to the claim as amended and is moot in view of new ground of rejection as presented above.

Correspondence/Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GOLAM MOWLA whose telephone number is (571) 270-5268. The examiner can normally be reached on M-Th, 0800-1830 EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ALEXA NECKEL can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/G. M./

Examiner, Art Unit 1795

/Ula C Ruddock/

Supervisory Patent Examiner, Art Unit 1795